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1311086

PATENT SPECIFICATION (11) 1311086

DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN OR RELATING TO BOTTLES

(71) We, BEECHAM GROUP LIMITED, a British Company, of Beecham House, Great West Road, Brentford, Middlesex, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

This invention concerns flexible bottles which are intended to contain a liquid and which produce a spray of the liquid when squeezed. Such bottles are commonly used to contain toiletry liquids such as deodorants, since it is often convenient to apply these liquids in the form of a fine mist or spray.

More particularly, this invention relates to squeeze bottles of the kind which are adapted to contain a liquid in a liquid region and a gas in a gas region and which are operated by squeezing the bottle to produce an increase in gas pressure in the gas region which causes liquid to be forced from the liquid region through a pipe to a mixing zone, and simultaneously causes gas to be forced through a gas passage to the said mixing zone, and causes the thus produced mixture of gas and liquid to be forced from said mixing zone through a spray orifice in the bottle, the liquid thereby emerging in the form of a spray.

In bottles of this kind which have been in use in the past, a nozzle having the orifice formed therein has been fitted in the neck of the bottle, or has been formed integrally with the neck. The mixing zone has been located adjacent to the orifice in the nozzle and the gas passage has been in the form of one or more small gas vents linking the mixing zone and the gas region. The separate gas and liquid regions have been provided by the simple expedient of only partially filling the bottle, the gas region then being the volume of the bottle above the liquid. However, when bottles of this construction are tilted beyond a certain critical angle dependent on the quantity of liquid in the bottle, the liquid has tended to flood the gas vents and thus prevent or inhibit the passage of gas from the gas region to the mixing zone when the bottle is squeezed. In the most common form of bottle employed in the past, the bottle was about half full at maximum and the nozzle was symmetrically disposed on the shoulder of the bottle. If such a bottle was tilted beyond the critical angle, the gas vents would flood and the efficient operation of the bottle would be prevented since the liquid would emerge as a series of spurts or as a continuous jet when the bottle was squeezed.

According to the present invention there is provided a squeeze-bottle of the kind referred to which has a neck, shoulder portion, side walls and base and which is divided into an upper chamber and lower chamber by a dividing barrier, and when the bottle is in an upright position, the entry end of the gas passage being within the lower chamber adjacent to said shoulder portion.

It will of course be understood that although the squeeze-bottle of this invention has been defined with reference to the liquid level when the bottle contains liquid, the invention also includes the squeeze-bottle when empty.

The improvement provided by this invention is most apparent when the nozzle is centrally disposed on the shoulder of the bottle. The problem of the air passage being flooded is not so severe with bottles having offset nozzles, but nonetheless the present invention can beneficially be applied to such bottles since the permissive angle of tilt is still increased.

The gas employed in bottles of the present invention is preferably air.

The dividing barrier may be positioned in the neck portion with a liquid carrying pipe passing sealingly through the barrier an communicating with a mixing zone ajacent to the spray orifice in the neck portion. In such a case, the barrier will divide the bottle into an upper chamber above the barrier in the neck of the bottle and a lower chamber below the barrier which will contain the liquid and the bulk of the gas, normally air, when the bottle is filled ready for use. With this construction

a second pipe may be provided passing through the barrier and communicating on one side with the gas region in the lower chamber and on the other side with the upper chamber, and a gas vent or vents may be provided linking the mixing zone with the upper chamber. The gas passage is then constituted by the combination of the second pipe, the upper chamber and the gas vent or vents.

Alternatively, instead of a second pipe, a suitably shaped conduit can be provided in the barrier itself.

In one preferred embodiment of this invention, the liquid-carrying pipe has its entry end in the angle between the base and side walls, and the gas-carrying passage has its entry end in the opposite angle between the shoulder portion and side walls. The lengths and positions of the pipe and gas-carrying passage may be so arranged in relation to the depth of the liquid in the bottle when in use that the bottle, when containing a certain volume of liquid, cannot be held in position where the ends of the pipe and gas-carrying passage are simultaneously below the surface of the liquid.

A preferred embodiment of the invention will now be described with reference to the accompanying drawings wherein:—

Figure 1 depicts one type of squeeze bottle in use prior to this invention.

Figure 2 shows the bottle of Figure 1 in an inoperable position.

Figure 3 depicts a squeeze-bottle according to the present invention in one of its embodiments.

Figure 4 depicts another type of bottle in accordance with the present invention.

Figure 5 illustrates the preferred bottle of the present invention.

Figures 6 and 7 illustrate how the bottle of Figure 5 can be used in any position.

Referring first to Figures 1 and 2 of the accompanying drawings, it can be seen that the previously employed squeeze-bottles (10) consisted of a neck portion (11), a body portion (12), and a base (13). A nozzle (14) was tightly fitted in the neck (11). The nozzle (14) had an orifice (15), and a liquid-carrying pipe (16) was wedged in the nozzle adjacent to the orifice (15). A gas passage (17) allowed the passage of gas, usually air, from the bottle interior to the orifice and vice versa. A mixing zone (18) was located between the end of the pipe (16) and the orifice (15). The pipe (16) generally terminated below the surface of the liquid (19) in the bottom corner (20) of the bottle.

The principle of operation of the bottle is quite simple. When the bottle is squeezed, the air pressure in the bottle increases and the air is forced through the air passage (17) and out of the orifice (15). Since the dimensions of the orifice and air passage are small, the expulsion of air is not immediate, and the residual air pressure in the bottle forces the liquid up pipe (16) and into the mixing zone (18). The liquid and air are thus mixed in zone (18) and then forced out through the orifice (15), the liquid/air mixture thereby emerging as a spray of liquid droplets.

For efficient operation it can be readily seen that more air must be present in the bottle than could be expelled by one squeeze of the bottle. If not, the liquid would rise up to the level of the air passage (17) and liquid would be expelled from the orifice as a jet, not a spray. Apart from this consideration, the prior bottles suffered from a tendency to malfunction as illustrated in Figure 2. It can be seen from Figure 2 that if the bottle were tilted beyond a certain angle, the angle being dependant on the volume of liquid and the geometry of the bottle, the air passage would be flooded by the liquid. The liquid would then emerge as a continuous jet or as a series of spurts, depending on how far the air passage was blocked.

This invention allows a bottle to be tilted, in at least one direction, to a greater angle before malfunctioning, than a similar bottle of the prior art having the same volume of liquid therein.

Thus Figure 3 of the accompanying drawings depicts one embodiment of a bottle in accordance with the present invention. It can be seen that the bottle (210) consists of a neck portion (211), a body portion (212), a shoulder (213) and a base (214) corresponding to the equivalent portions of Figure 1. Again, a nozzle (214) is tightly fitted in the neck of the bottle. The nozzle has an orifice (215) and a liquid carrying pipe (216) wedged in the nozzle adjacent to the orifice (215). An air vent (217) is provided alongside the end of pipe (216) and a mixing zone (218) is left between the end of the pipe (216) and the nozzle orifice (215). The liquid carrying pipe (216) has an entry end (229). It will be noted that, so far, the construction of the squeeze-bottle is similar to that of the bottle of Figure 1. In contrast to Figure 1, however, the bottle of Figure 3 has a barrier (221) wedged sealingly in the neck of the bottle. The barrier (221) divides the bottle into an upper chamber (222) which holds only air and a lower chamber (223) which holds air and liquid (219). The pipe (216) passes sealingly through the barrier (221) at a point (224) near the wall of the neck of the bottle and a conduit (225) is formed in the barrier linking the upper chamber (222) and the lower chamber (223). The entire air passage is constituted by the air vent (227), the upper chamber (222) and the conduit (225). It has an entry (227).

It can be seen that the arrangement described above has the effect of moving the entry end of the air passage further from the longitudinal axis of the bottle than is the case in the bottle of Figure 1. It will therefore be immediately apparent that the bottle can be

tilted further in one direction (to the left as the bottle is drawn in Figure 3), than the bottle of Figure 1 without the liquid flooding the air passage, providing the volume of liquid is the same in both cases. Basically, it seems that the reason for this improvement is that the air intake of the gas passage has been extended by including the upper chamber (222) and the conduit (225) in the gas train, and the air intake end (227) of the gas passage has been positioned so that as the bottle is tilted the mixing zone (218) drops below the liquid level before the air intake end of the conduit (225) does so.

Figure 4 shows a construction identical to that of Figure 3 except that an extension pipe (326) is fitted in the horizontal part of conduit (325), thereby extending the air passage even further. Clearly this construction will allow a greater operable degree of tilt than the construction of Figure 3.

In Figure 5 the conduit in the barrier is constituted by a second pipe (425) having an approximately right angled bend. The pipe (425) terminates in the top corner (427) of the bottle between the shoulder and the side walls. Here again it will be noted that the operable degree of tilt for a given volume of liquid is much greater than the construction of Figure 3.

However, as mentioned above, the construction of Figures 3 and 4 can only be effectively tilted in one direction i.e. to the left as shown in the drawings. In the other direction, the air passage would soon be immersed below the surface of the liquid as the bottle was tilted. With the construction of Figure 5, the lengths of the two pipes (416 and 425) can be so varied that there are fewer positions for a given volume of liquid in which the ends of the pipes in the lower chamber are simultaneously submerged below the surface of the liquid. This is illustrated in Figures 6 and 7 where it can be seen that if the air intake pipe (425) is immersed the liquid-carrying pipe (416) is clear and the roles of the two pipes are reversed.

It will be realised that with all the embodiments of the present invention, there are certain combinations of liquid level, pipe positioning, and angle of tilt of the bottle, where the liquid entry end and gas entry end may simultaneously be below the level of the liquid. However it will also be clear that for any given construction within the scope of the present invention there are only a very few such positions and even in such cases if the bottle is agitated even to a small extent, one or other of the entry ends will be uncovered at any given time.

Although the invention has been described with reference to squeeze-bottles having the particular shape shown, various other shapes may be employed. Likewise, various materials may be employed in the fabrication of the bottle, provided they are resilient enough to permit the bottle to be squeezed. The dimensions of the several components of the bottle can be varied within wide limits depending on the intended application of the bottle. For example the fineness of the spray can be controlled by varying the size of the nozzle orifice.

The squeeze-bottle of this invention may be used to contain virtually any liquid which is to be delivered in the form of a spray. It is particularly suitable for such toiletry products as deodorants and shampoos.

WHAT WE CLAIM IS:—

1. A squeeze bottle of the kind which is adapted to contain a liquid in a liquid region and a gas in a gas region and which is operated by squeezing the bottle to produce an increase in gas pressure in the gas region which causes liquid to be forced from the liquid region through a pipe to a mixing zone, and simultaneously causes gas to be forced through a gas passage to the said mixing zone, and causes the thus produced mixture of gas and liquid to be forced from said mixing zone through a spray orifice in the bottle, the liquid thereby emerging in the form of a spray, which bottle has a neck, shoulder portion, side walls and base, and which is divided into an upper chamber and a lower chamber by a dividing barrier, and when the bottle is in an upright position, the entry end of the gas passage being within the lower chamber adjacent to said shoulder portion.

2. A squeeze bottle, as claimed in claim 1, in which bottle the spray orifice communicates with the upper chamber via the mixing zone, the liquid carrying pipe passes sealingly through the barrier and communicates with the mixing zone and the gas passage is constituted by:

(i) a gas carrying conduit or pipe passing sealingly through the barrier, communicating on one side with the upper chamber and on the other side with the lower chamber in the region adjacent to the shoulder portion;

(ii) the upper chamber; and

(iii) a gas vent linking the mixing zone with the upper chamber.

3. A squeeze bottle as claimed in claim 1 or claim 2 wherein the liquid-carrying pipe has its entry end in the angle between the base and side walls and the gas-carrying passage has its entry end in the opposite angle between the shoulder and side walls.

4. A squeeze bottle as claimed in Claim 1, substantially as hereinbefore described with

reference to and as illustrated in any one of Figures 3, 4, or 5 of the accompanying drawings.

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Agent for the Applicants
Chartered Patent Agent.

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1311086 COMPLETE SPECIFICATION
4 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

FIG. 1.

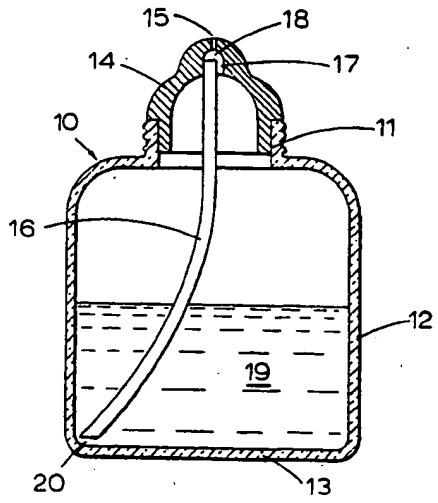

FIG. 2.

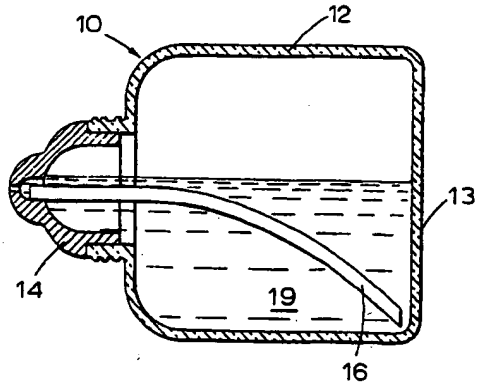

FIG.3.

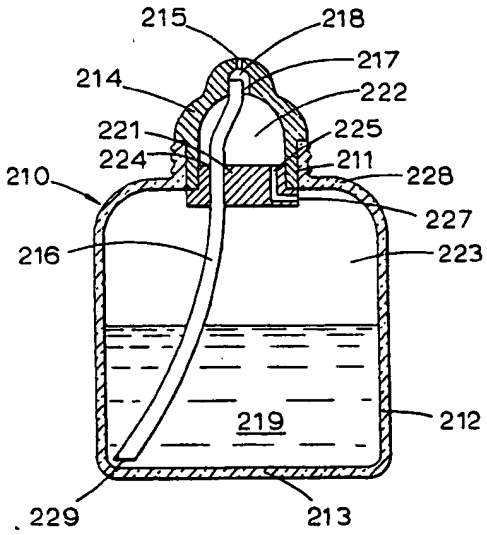
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FIG. 4.

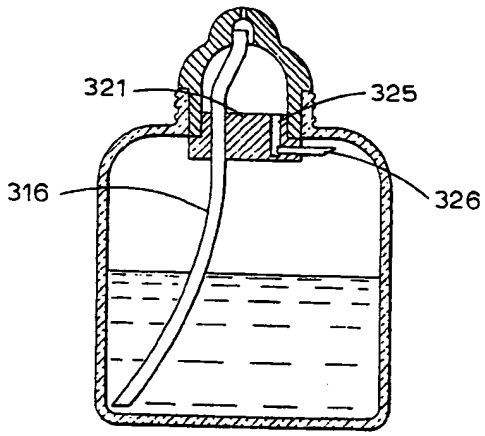
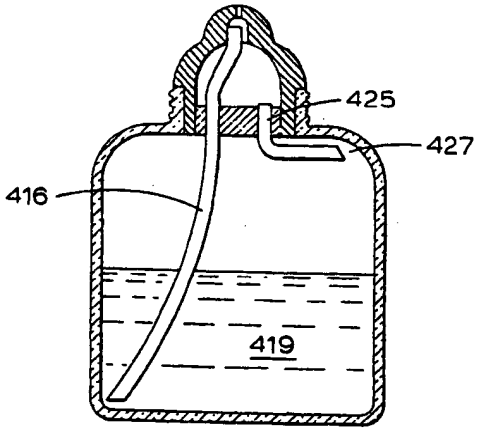


FIG. 5.



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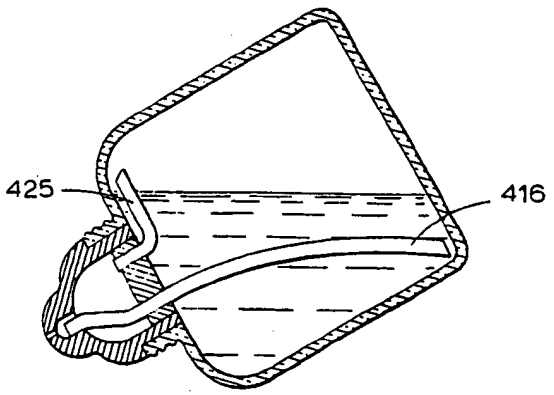

FIG. 7.

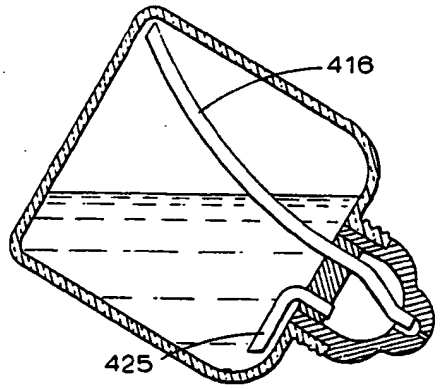

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FIG. 1.

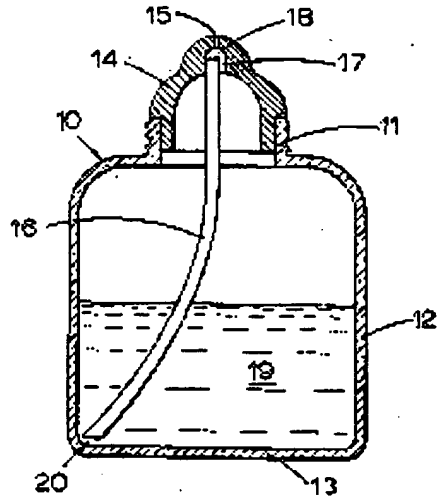

FIG. 2.

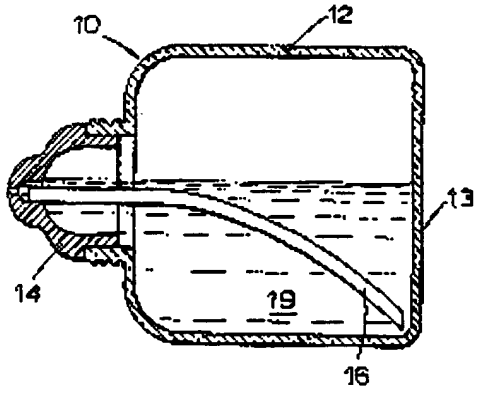

FIG.3

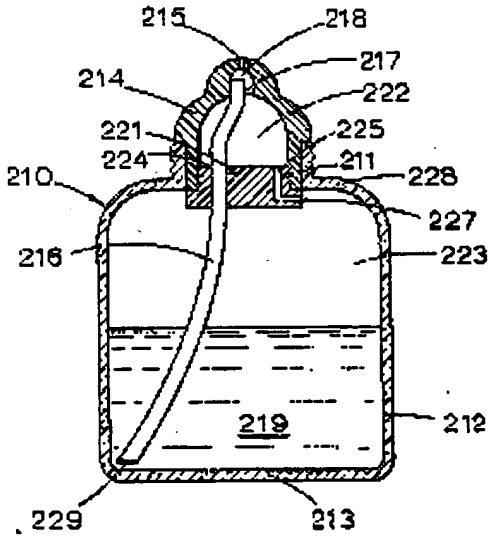
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FIG. 4.

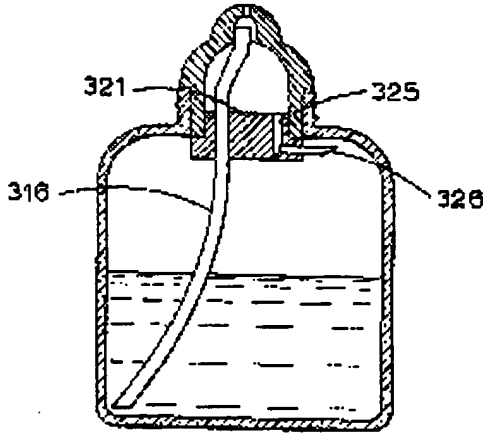

FIG. 5.

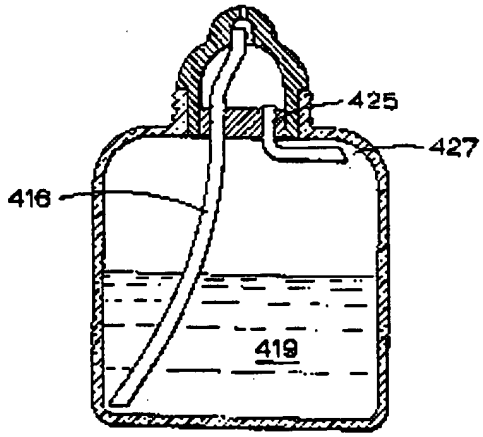

FIG. 6.

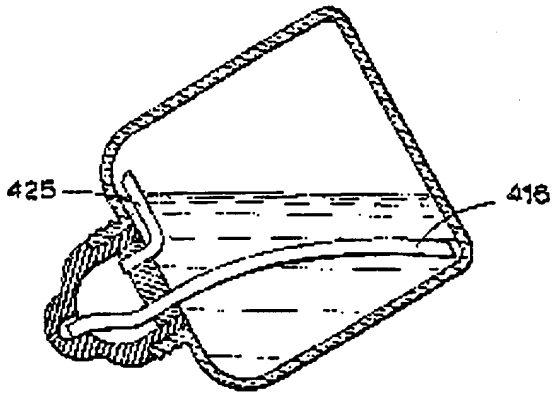

FIG. 7.